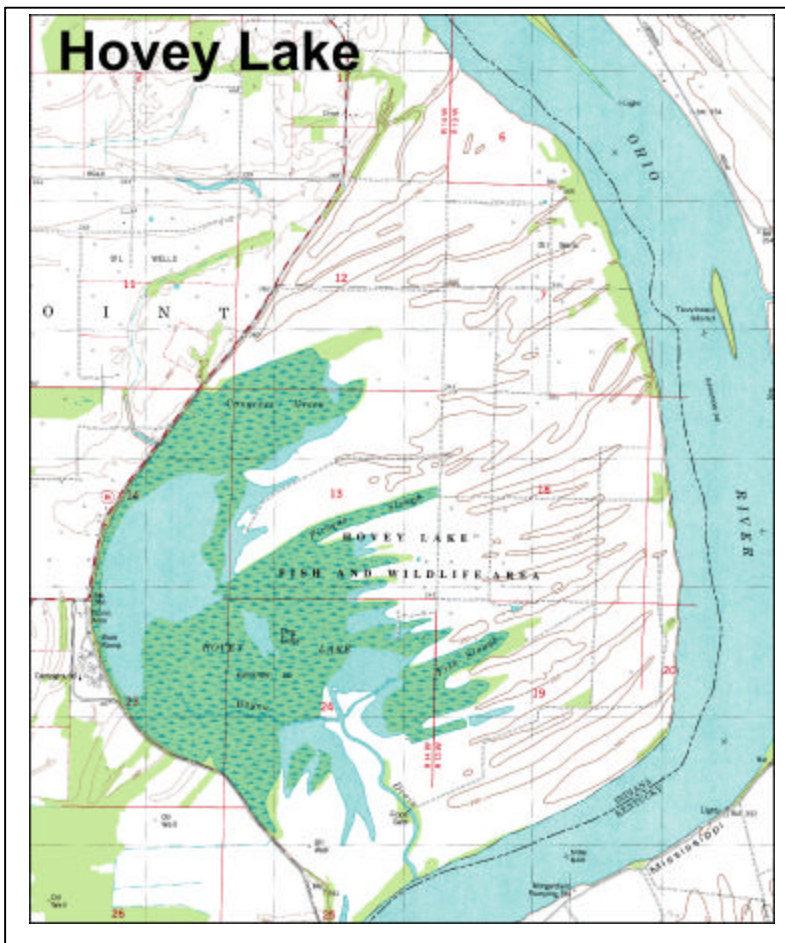


Hovey Lake Restoration & Hovey Lake Habitat Restoration (IN-10/11)

1.0 Location

The proposed Hovey Lake Restoration Project area is located at the State of Indiana's Hovey Lake Fish and Wildlife Management Area (FWA). The Indiana Department of Natural Resources (IDNR) manages Hovey Lake FWA. The Hovey Lake FWA encompasses an area that includes lands owned by the U.S. Federal Government as well as the State of Indiana. The proposed Hovey Lake Restoration Project includes restoration efforts on the FWA proper as well as on adjoining private lands.

The Hovey Lake project area is located in rural Posey County, Indiana approximately 7 miles south of the town of Mt. Vernon, Indiana. The project site is located in the J. T. Myers Pool near Ohio River Miles (ORM) 835-841. Hovey Lake is within the jurisdiction of the Louisville District, U.S. Army Corps of Engineers (USACE).



2.0 Project Goal

Hovey Lake is one of a few large Ohio River oxbow lakes remaining in the State of Indiana. Oxbow lakes, which are cut-off from the river except during periods of high river stage, are important spawning, nursery and feeding areas for riverine fishes. Oxbow lakes also provide important habitat for migratory waterfowl, wading birds and other wildlife.

Oxbow lakes, due to their cut-off nature and location within river floodplains, historically slowly fill in with sediments. Prior to establishment of commercial navigation and the construction of dams, the creation and loss of oxbow lakes was a natural event. New oxbows were formed whereas older oxbows gradually filled in with



sediment and became terrestrial habitat, consequently oxbow habitats were typically always present within the river system. With the establishment of the navigation system on the Ohio River the natural process of oxbow lake formation has ceased. New Ohio River oxbow lakes are no longer being formed. Consequently, the remaining oxbow lakes have become unique habitats that the State of Indiana wishes to protect and restore as functioning aquatic ecosystems.

3.0 Project Description and Rationale

The specific goals of the Hovey Lake restoration project include two distinct elements designed to prolong the functional life of the aquatic ecosystem at Hovey Lake and to improve the fish and wildlife habitat within the project area. The principal elements of the Hovey Lake Restoration Project are:

1. **Restoration of Oxbow Habitat.** The backwater habitat within the Hovey Lake oxbow serves as reproductive, feeding, nursery, high water refuge, seasonal migration and overwintering habitat for many fish species including paddlefish. Maximum depth of the lake has decreased by at least 3 feet since 1976 when the J. T. Myers Locks and Dam were completed. The aquatic habitat at Hovey Lake will be restored by dredging 50% of the 300-acre open basin to an average depth of 20 feet at normal pool.
2. **Erosion/Sediment Control and Ohio River Bank Stabilization.** Hovey Lake receives sediment deposition during Ohio River flood events. When the Ohio River leaves its banks, it floods across the private agricultural land north of Hovey Lake and into Hovey Lake. The flood waters carry sediments from: a) floodplain scour in the farmed areas north of the lake, b) river borne sediments and c) heavy bank erosion along the Ohio River banks north of the lake. The flood induced sedimentation appears to have increased since 1995 after erosion control structures were installed on Slim Island and the logging of trees occurred on the land north of the lake. These events appear to have changed the direction of the flood current and increased sediment loading in Hovey Lake. Restoration activities to address this problem will include:
 - 2a. **Shoreline Stabilization.** The Ohio River shoreline north of the lake is unstable and exhibits heavy bank erosion. This shoreline will be stabilized and bank erosion minimized by installing “A-jacks” structures. These structures will stabilize the banks and allow for natural re-vegetation and subsequent erosion control to occur.
 - 2b. **Reforestation.** Sedimentation reduction in Hovey Lake will be augmented via flood desynchronization. Reforestation of a large parcel near the Ohio River north of the lake will reduce erosion and slow flood waters allowing the sediment load to be dropped north of Hovey Lake rather than in Hovey Lake.

The completion of these elements will reduce the loss of oxbow habitat and restore the aquatic ecosystem of Hovey Lake. Habitat restoration will also be augmented via Indiana Department of Natural Resources management efforts, which may include:

1. Working with adjacent landowners to implement a series of Best Management Practices to reduce erosion of farmland.
2. Planting a series of forested/vegetated buffers between cropped fields to reduce lake sedimentation and reduce floodwater velocity.
3. Use of some dredge material to create swamp rabbit refuge at Hovey Lake FWA. and
4. Capping of oil wells as necessary to reduce risk of contamination.

4.0 Existing Conditions

Terrestrial/Riparian Habitat: The habitat at the Hovey Lake project site consists of Hovey Lake with its bald cypress (*Taxodium distichum*) community in and adjacent to the lake as well as the surrounding area comprised of agricultural land and bottomland/riparian forested areas. Hovey Lake FWA is primarily managed for waterfowl, however a wide variety of game and nongame species occur in the area including white-tailed deer, turkey, great blue heron, and river otter.



Hovey Lake Bald Cypress



Agriculture at Hovey Lake

The habitat within the project area north of Hovey Lake FWA is privately owned and is principally agricultural in nature. Along the banks of the Ohio River scattered trees are present. Throughout most of the project area the river banks exhibit heavy bank erosion.



Eroding River Bank



Flood Scoured Field

Aquatic Habitats: Hovey Lake aquatic habitat is dominated by shallow water areas (approximately 1 to 5 feet deep) that support stands of bald cypress. The lake also contains a 300 acre deep water basin with water approximately 6 to 10 feet deep under normal pool conditions. The lake supports a diverse fishery including orangespotted sunfish, yellow bass, bluegill, white crappie, channel catfish, and other species. The lake is also known to hold large numbers of paddlefish (Hovey Lake Fish Survey, 1996).

Wetlands: Wetlands within the Hovey Lake project area are primarily limited to the riparian areas adjacent to the lake.

Federally-Listed Threatened and Endangered Species According to the U.S. Fish and Wildlife Service (USFWS), there are 7 federally-listed threatened or endangered species known to occur in Posey County, Indiana (Table 1).

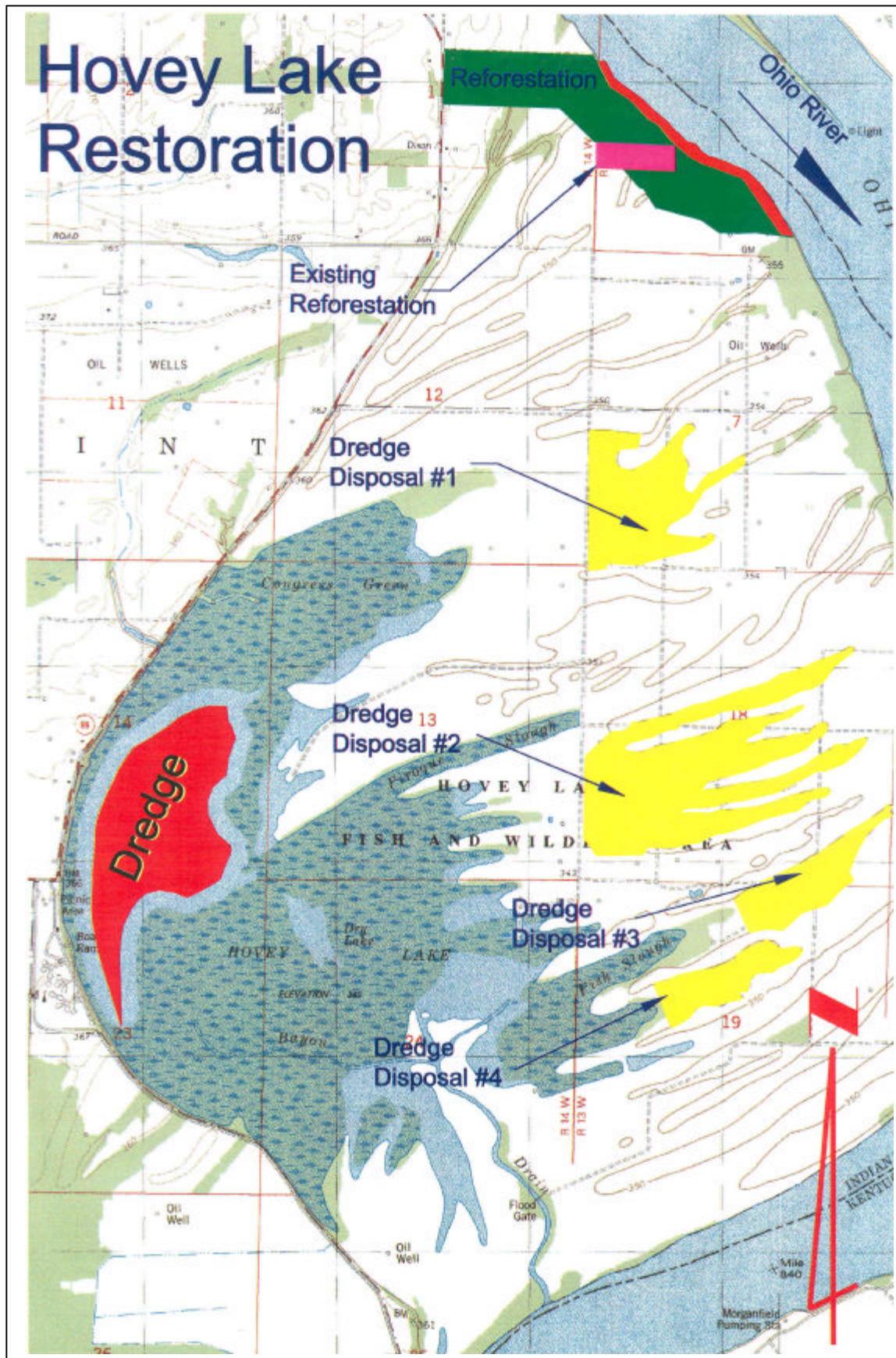
| Table 1. Federally-listed species known to occur in Posey County, Indiana. | | | |
|---|---------------------------------|-----------------------|------------------------|
| Common Name | Scientific Name | Federal Status | Habitat Present |
| Indiana bat | <i>Myotis sodalis</i> | Endangered | Yes |
| Bald eagle | <i>Haliaeetus leucocephalus</i> | Threatened | Yes |
| Tubercled blossom mussel | <i>Epioblasma torulosa</i> | Endangered | River |
| Pink mucket pearly mussel | <i>Lampsilis abrupta</i> | Endangered | River |
| Ring pink mussel | <i>Obovaria retusa</i> | Endangered | River |
| Rough pigtoe mussel | <i>Pleurobema plenum</i> | Endangered | River |
| Fat pocketbook mussel | <i>Potamilus capax</i> | Endangered | River |
| <i>Source: U.S. Fish and Wildlife Service, 1999</i> | | | |

The Indiana bat is known to occur in the project area at Hovey Lake FWA. The riparian area provides summer roosting and foraging habitat for this species.

Bald eagles over winter at Hovey Lake. Hovey Lake is also known to provide habitat for successful nesting bald eagles.

The five endangered mussel species known from Posey County would not be found in Hovey Lake. These species are more typically associated with the riverine habitats in the Ohio and Wabash Rivers.

5.0 Project Diagram



6.0 Engineering Design, Assumptions, and Requirements

6.1 Existing Ecological/Engineering Concern

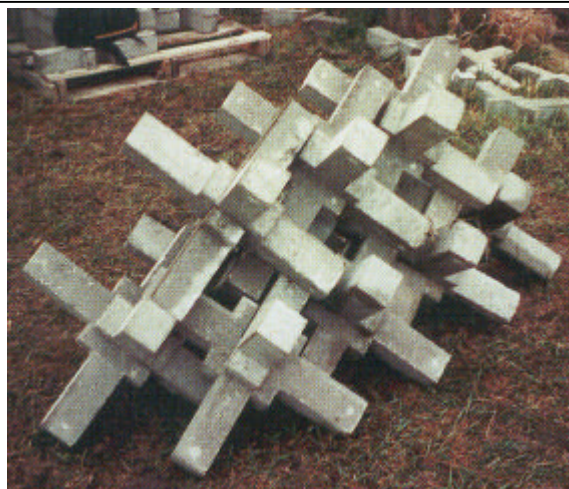
Hovey Lake is one of a few large Ohio River oxbow lakes remaining in the State of Indiana. Hovey Lake is slowly filling in with sediments. The State of Indiana wishes to protect and restore this unique aquatic ecosystem.

6.2 Hovey Lake Dredging

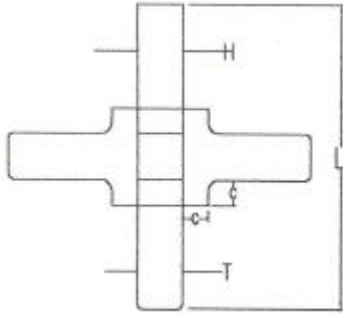
Maintenance dredging of Hovey Lake is required to provide deep water habitat, and to extend the life of the historic oxbow. An estimated 2,490,000 cubic yards of silty-clay material would be dredged to restore depths of 7-20 feet. The outer limits of dredging would occur approximately 100 yards inside of the open basin area of Hovey Lake (approximately 145-acres of the 300-acre open basin will be dredged). Depths at this distance currently range from 6-7 feet. Dredging would begin at this location and would descend at a 10:1 slope to depths of 20 feet. Four dredge disposal sites are adjacent to the lake. Small geotube levees, 5 feet high would be constructed at the designated disposal sites for dewatering. All disposal areas are located on property owned by the State of Indiana. The disposal areas will be graded to a near even height and reseeded with native species following the dewatering process.

6.3 Shoreline Stabilization

River currents in conjunction with barge traffic are actively eroding the Ohio River bank. The erosion has produced steep banks with little or no vegetation and a biostabilization approach to bank protection is preferred to simple bank hardening (rip-rap). A-jacks® by Armortec, or similar structures, will be used as structural bank reinforcement at the underwater base of the eroding bank combined with revegetation of the upper slope (approximately 0.9 miles of shoreline will be stabilized). A-jacks® are assembled into a highly porous, interlocking matrix. The voids created by the interlocking A-jacks®, or similar structures, are filled with soil to establish a foundation to support woody vegetation above the normal pool elevation of the Ohio River. A geotextile fabric would be used in conjunction with an aggregate base to reduce the removal of fine soils while the root systems are developing. Light mast producing trees such as black willow, cottonwood, and sycamore will be allowed to reseed/regenerate naturally in the structure voids. If necessary, additional cuttings and rooted stock can be placed in and behind the A-jacks® matrix along the earthen berm to augment natural revegetation.



A-jacks Structures



| A-Jacks | L(in) | T(in)/H(in) | C(in) | Vol(ft ³) | Wt(lbs) |
|---------|-------|-------------|-------|-----------------------|---------|
| AJ-24 | 24 | 3.68 | 1.84 | 0.56 | 78 |
| AJ-36 | 36 | 5.52 | 2.76 | 1.89 | 265 |
| AJ-48 | 48 | 7.36 | 3.68 | 4.49 | 629 |
| AJ-72 | 72 | 11.04 | 5.52 | 15.14 | 2,120 |
| AJ-96 | 96 | 14.72 | 7.36 | 35.87 | 5,022 |

A-jacks® Dimensions



A-jacks® Bank Stabilization

6.4 Reforestation

Approximately 120 acres of floodplain will be reforested with native mast producing bottomland hardwood trees. The forested area will aid in the reduction of drift, trash, and sediments from Ohio River floodwaters into Hovey Lake. Historically, these sediment and trash laden floodwaters have accelerated the filling of Hovey Lake. The reforestation will aid in flood desynchronization and prolong the life and viability of the Hovey Lake ecosystem.

Soil types, hydrology, and terrain position will be the primary factors considered when selecting the tree species to be planted, and a detailed planting design should be developed in order to insure that the planting effort is successful. Typical bottomland species to be planted in the floodplain area would include pin oak (*Quercus palustris*), swamp chestnut oak (*Quercus michauxii*), swamp white oak (*Quercus bicolor*), pecan (*Carya illinoensis*), and shagbark hickory (*Carya ovata*). Aggressive light mast producing species, such as silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), sycamore (*Platanus occidentalis*), and/or willows (*Salix* spp), would be expected to regenerate naturally.

6.5 Planning/Engineering Assumptions

Dredging

- ◆ Three small auger head dredges would be used, and the material would be pumped directly to the disposal sites. All dredges would be utilized in three shifts.
- ◆ All dredge disposal sites were selected from USGS topographic maps, and site visits. Detailed survey data would be required to better determine the limits, and volumes of the disposal areas.

Bank Stabilization

- ◆ Average channel velocities are 3 feet per second.
- ◆ Armortec's A-jacks® AJ-24 units would be used to stabilize the toe of the eroding slope. Each unit weighs 78 pounds and is small enough to be assembled and placed by hand.
- ◆ Two rows of A-jacks® would be toed into the river bed a minimum of 1.5 feet deep.
- ◆ A-jacks® would be interconnected in rows along the toe trench. Two rows would be used at the base, with a single row on top.
- ◆ Backfill sediment for the voids would be taken from onsite.

Reforestation

- ◆ Nursery stock for reforestation will be obtained from a State of Indiana nursery.
- ◆ Bare root seedlings will be planted in a similar manner to ongoing reforestation efforts being conducted in the Hovey Lake area.

7.0 Cost Estimate (Construction)

Dredging - Engineering costs for the proposed project are contained on Table 2. A detailed MCACES cost estimate for the proposed project is included in Appendix D.

| Table 2. Engineering Costs. | |
|--------------------------------------|--------------------|
| Item – Hovey Lake Restoration | Cost |
| Dredging | \$2,346,000 |
| Geotube Levee | \$79,300 |
| A-Jacks Bank Stabilization | \$241,100 |
| Reforestation | \$31,700 |
| Mobilization and Contingencies @ 20% | \$269,800 |
| TOTAL | \$2,750,900 |

8.0 Schedule

Hovey Lake Restoration: The estimated construction time is shown on Table 3.

| Table 3. Construction Schedule. | |
|--|-----------------|
| Item – Hovey Lake Restoration | Cost |
| Dredging | 307 Days |
| Levee | 42 Days |
| Dewatering | 168 Days |
| A-Jacks Bank Stabilization | 60 Days |
| Reforestation | 15 Days |
| Mobilization | 12 Days |
| TOTAL | 604 Days |

9.0 Expected Ecological Benefits

Terrestrial/Riparian Habitat: The Hovey Lake Restoration project would result in long-term beneficial impacts to terrestrial/riparian resources. The reforestation of 120 acres adjacent to the Ohio River would be considered a long-term beneficial impact to terrestrial/riparian resources. Although the reforestation is primarily designed to aid in flood desynchronization, the reforestation would be beneficial to many game and nongame species of wildlife. The conversion of agricultural lands to upland and bottomland forest, would result in sustained long-term beneficial impacts to terrestrial resources.

The dredging activities proposed for Hovey Lake would be within the open basin of the lake. There would be no reasonably foreseeable beneficial impacts to terrestrial/riparian resources associated with the dredging activities.

Aquatic Habitats: Long-term beneficial impacts to aquatic resources would be anticipated as a result of implementing the proposed project. Dredging of the open basin at Hovey Lake would result in long-term beneficial impacts to fishes due to the improved/deepened waters in the oxbow. Habitat requirements for fishes change seasonally and improved depth in the oxbow would be considered beneficial. Restoring/increasing the depths of the oxbow would provide over-wintering habitat for fishes, especially fish such as paddlefish. The project would result in an overall improvement in off channel aquatic habitat in the area and an increase in the functional life of the Hovey Lake aquatic ecosystem.

Long-term beneficial impacts to aquatic resources would also be anticipated as a result of the proposed reforestation and bank stabilization. The reforestation along the river bank would reduce potential stream bank erosion. The conversion of agricultural land to forest would indirectly improve water quality by reducing the amount of silt and contaminants from entering the Ohio River via stormwater runoff.

Wetlands: There would be long-term beneficial impacts to jurisdictional wetlands as a result of implementing the proposed project. Reforestation would provide buffers for riparian zones and bottomland hardwoods in the vicinity of Hovey Lake.

Federally-Listed Threatened and Endangered Species: There would be minor beneficial impacts to the Indiana bat and bald eagle associated with the planned reforestation. The project will result in a net increase in forested riparian habitat within the study area that can be utilized by these species.

Other than indirect benefits associated with improved water quality, there would be no reasonably foreseeable beneficial impacts to the endangered mussel species in the Ohio River near the project site as a result of implementing the proposed project.

Socioeconomic Resources: There would be short-term and long-term beneficial impacts to socioeconomic resources as a result of implementing the proposed project. The short-term beneficial impacts would be related to costs and local expenditures associated with the dredging of Hovey Lake and the bank stabilization and reforestation of the Ohio River shoreline. Long-term socioeconomic benefits would be realized through improved recreational fishing and hunting opportunities. Long-term indirect beneficial impacts will be realized through local expenditures for fishing and hunting gear, food, gas, and other associated products.

10.0 Potential Adverse Environmental Impacts

Terrestrial/Riparian Habitat: There would be short-term adverse impacts to the agricultural lands adjacent to Hovey Lake. Short-term impacts would occur associated with the disposal of the dredge material on the adjacent agricultural lands. Adverse impacts to this area would be considered short term, because it is assumed that the site can be farmed following the dewatering and grading of the dredge material. These agricultural fields are primarily used by Hovey Lake FWA as part of their on-going waterfowl management program.

Aquatic Habitats: There would be a potential for minor adverse affects to aquatic species in the lake and in the river. In Hovey Lake adverse impacts may occur to immobile benthic invertebrates during the dredging operations. Localized populations of benthic invertebrates could be directly disturbed during the construction operation. However, the invertebrate populations within the open water basin of the lake where the dredging is proposed are not expected to be as abundant, diverse, or important to the ecosystem as the invertebrates colonizing the shallow water bald cypress portions of Hovey Lake.

The dredging operations in Hovey Lake may also have a short-term adverse impact on the fish population by directly disturbing their habitat and increasing turbidity. However, with the exception of open water species such as paddlefish, the open water basin of the lake, where the dredging will occur, is not expected to contain the number and diversity of fishes that are supported within the shallow water bald cypress portions of Hovey Lake.

Adverse impacts to aquatic species in the Ohio River will be short-term and minor. During the bank stabilization phase of the proposed project, sensitive aquatic species immediately downstream from the site could be adversely impacted by degraded water quality associated with displaced bank sediments.

It is assumed that Hovey Lake, with its current average depth of approximately six to eight feet, stratifies during the summer, and anoxic zones are created. Following the dredging/deepening of Hovey Lake, there would continue to be a potential for summer stratification, and subsequent anoxic zones may become established in deep water areas. It is unlikely that the stratification of Hovey Lake would cause meaningful additional adverse affects to aquatic resources.

Wetlands: There would be no adverse effects to jurisdictional wetlands as a result of implementing the proposed plan.

Federally-Listed Threatened and Endangered Species: There would be no reasonably foreseeable adverse impacts to most federally listed threatened and endangered species as a result of implementing the Hovey Lake Restoration project. There is the potential for the dredging operations to disturb bald eagles at Hovey Lake. The dredging operations will be

limited to the open basin of the lake and will not influence the other portions of the Hovey Lake FWA, consequently these impacts are expected to be short-term and minor.

Socioeconomic Resources: There would be long-term and short-term adverse impacts to socioeconomic resources as a result of implementing the Hovey Lake Restoration Project. The long-term impacts will be associated with the permanent loss of approximately 120 acres of terrestrial floodplain agricultural lands that will be reforested. There would be short-term adverse impacts associated with the temporary loss of farming on approximately 320 acres of land comprising the dredge material disposal sites. These impacts would be short term because it is assumed that the disposal area can be farmed following the completion of the dredge material dewatering.

11.0 Mitigation

Minor impacts associated with site dredging and material placement may occur during the construction of this project, however, no significant adverse impacts are expected. The use of best management practices and proper construction techniques would minimize adverse water quality impacts.

Following the completion of the dredging and spoil dewatering operation, the dredge disposal site will be graded and restored for agricultural / wildlife management purposes.

12.0 Preliminary Operation and Maintenance Costs:

Operation and Maintenance costs are summarized on Table 4.

| Table 4. Operation and Maintenance Costs(50 Year Project Life) | | |
|---|------------------|--------------|
| Maintenance | Frequency | Costs |
| Hovey Lake | 25 Years | \$500,000 |
| Bank Stabilization | 10 Years | \$120,600 |

13.0 Potential Cost Share Sponsor(s)

- ◆ Indiana Department of Natural Resources
- ◆ Natural Resources Conservation Service
- ◆ Ducks Unlimited
- ◆ Navigation Industry
- ◆ Private Entities

14.0 Expected Life of the Project

The expected life of the project is 50 years.

15.0 Hazardous, Toxic, and Radiological Waste Considerations

Potential impacts of hazardous, toxic, and radiological waste (HTRW) at the site were visually assessed during a site visit and further assessed via a database search of HTRW records in the site area.

Site Inspection Findings. The project site consist Hovey Lake and a land area surrounding the lake which is located in Posey County Indiana at Ohio River mile 835-840. Hovey Lake is an oxbow lake formed by a meander cutoff of the Ohio River. Uniontown, KY is the nearest town to the project area and is located south across the Ohio River from Hovey Lake.

OHIO RIVER MAINSTEM ECOSYSTEM RESTORATION PROJECT – FINAL REPORT

The following environmental conditions were considered when conducting the project area inspection on June 29, 1999:

- ◆ Suspicious/Unusual Odors;
- ◆ Discolored Soil;
- ◆ Distressed Vegetation;
- ◆ Dirt/Debris Mounds;
- ◆ Ground Depressions;
- ◆ Oil Staining;
- ◆ Above Ground Storage Tanks (ASTs);
- ◆ Underground Storage Tanks (USTs);
- ◆ Landfills/Wastepiles;
- ◆ Impoundments/Lagoons;
- ◆ Drum/Container Storage;
- ◆ Electrical Transformers;
- ◆ Standpipes/Vent pipes;
- ◆ Surface Water Discharges;
- ◆ Power or Pipelines;
- ◆ Mining/Logging; and
- ◆ Other

Inactive oil wells were observed in the project area. None of the other environmental conditions listed above were observed in the project area.

Risk Management Data Search. A search of available environmental records was conducted by Environmental Data Resources, Inc. (EDR). The search complied with ASTM Standard Practice for Environmental Site Assessments, E 1527-97. The search report with an enlarged map showing the search area around the project site is presented in Appendix B. The search distance was configured to include the area of the project and a one-mile buffer zone beyond the project area boundary. It was conservatively assumed that any environmental conditions beyond the project area buffer zone would not impact the project. The database search consisted of a landmass covering the entire Hovey Lake peninsula to include a one mile buffer beyond the outer limits of the project area boundary (see map in Appendix B). The HTRW item searched (e.g., USTs, NPL sites, etc.) and area searched are as follows:

| Databases | Search Area |
|---|--|
| NPL: National Priority List | Entire Hovey Lake Peninsula and a 1.0 mile buffer beyond the project boundary. |
| RCRIS-TSD: Resource Conservation and Recovery Information System | Entire Hovey Lake Peninsula and a 1.0 mile buffer beyond the project boundary. |
| SHWS: State Hazardous Waste Sites | Entire Hovey Lake Peninsula and a 1.0 mile buffer beyond the project boundary. |
| CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System | Entire Hovey Lake Peninsula and a 1.0 mile buffer beyond the project boundary. |
| CORRACTS: Corrective Action Report | Entire Hovey Lake Peninsula and a 1.0 mile buffer beyond the project boundary. |
| SWF/LF: Available Disposal for Solid Waste in Illinois- Solid Waste Landfills Subject to State Surcharge | Entire Hovey Lake Peninsula and a 1.0 mile buffer beyond the project boundary. |
| LUST: Leaking Underground Storage Tank | Entire Hovey Lake Peninsula and a 1.0 mile buffer beyond the project boundary. |
| UST: Underground Storage Tank | Entire Hovey Lake Peninsula and a 1.0 mile buffer beyond the project boundary. |
| RCRIS-SQG: Resource Conservation and Recovery Information System for Small Quantity Generators | Entire Hovey Lake Peninsula and a 1.0 mile buffer beyond the project boundary. |
| RCRIS-LQG: Resource Conservation and Recovery Information System for Large Quantity Generators | Entire Hovey Lake Peninsula and a 1.0 mile buffer beyond the project boundary. |
| ROD: Record of Decision | Entire Hovey Lake Peninsula and a 1.0 mile buffer beyond the project boundary. |
| CONSENT: Superfund (CERCLA) Consent Decrees | Entire Hovey Lake Peninsula and a 1.0 mile buffer beyond the project boundary. |
| Coal Gas: Former Manufactured gas (Coal Gas) Sites | Entire Hovey Lake Peninsula and a 1.0 mile buffer beyond the project boundary. |
| MINES: Mines Master Index File | Entire Hovey Lake Peninsula and a 1.0 mile buffer beyond the project boundary. |

The HTRW database search did not reveal negative environmental conditions in the project area in Indiana. The database search also included areas across the Ohio River in Kentucky. Environmental conditions in Kentucky included a coal mine, and one RCRA small quantity

generator. The database search identified various environmental conditions such as USTs, LUSTs, CERCLA sites and landfills beyond the one mile buffer zone surrounding the Hovey Lake peninsula project area.

HTRW Findings and Conclusions. Oil wells observed during the site inspection are a potential source of hydrocarbon contamination of groundwater from well casings that may have leaked over time. Soils around oil production areas have the potential for contamination from buried drill muds and cuttings at drilling sites, produced water spills at oil/water separators, spills/discharges of sludges and water from storage tanks, and oily waste/sludges in abandoned production pits. With the exception of potential hydrocarbon, and drill muds and cuttings contamination at petroleum production sites, the site inspection and search of environmental records have revealed no other evidence of recognized HTRW problems in connection with this project site.

16.0 References

| References: | |
|--------------------|---|
| Scott, 1989 | Scott, M.T. and L.A. Nielson. 1989. Young fish distribution in backwaters and main-channel borders of the Kanawha River, West Virginia. <i>Journal of Fisheries Biology</i> No. 35 (Supplement A) pp. 21-27. |
| Sheaffer, 1986 | Sheaffer, W.A. and J.G. Nickum. 1986. Backwater areas as nursery habitats for fishes in Pool 13 of the Upper Mississippi River. <i>Hydrobiology</i> No. 136 pp. 131-140. |
| Sheehan, 1994 | Sheehan, R.J., W.M. Lewis, and L.R. Bodensteiner. 1994. Winter habitat requirements and overwintering of riverine fishes. Fisheries Research Laboratory, Southern Illinois University, Carbondale, Illinois. Final Report F-79-R-6. |
| USFWS, 1999 | U.S. Fish and Wildlife Service, July 1, 1999. Federally Listed Endangered and Threatened Species in Indiana. |

APPENDIX A Threatened & Endangered Species

APPENDIX B Hazardous Toxic and Radiological Wastes

APPENDIX C Plan Formulation and Incremental Analysis Checklist

Project Site Location:

The proposed Hovey Lake Restoration Project area is located at the State of Indiana's Hovey Lake Fish and Wildlife Management Area (FWA). The Hovey Lake project area is located in rural Posey County, Indiana approximately 7 miles south of the town of Mt. Vernon, Indiana. The project site is located in the J. T. Myers Pool near Ohio River Miles (ORM) 835-841. Hovey Lake is within the jurisdiction of the Louisville District, U.S. Army Corps of Engineers (USACE).

Description of Plan Selected: The elements of the Hovey Lake Restoration Project are:
Restoration of Oxbow Habitat. The aquatic habitat at Hovey Lake will be restored by dredging 50% of the 300-acre open basin to an average depth of 20 feet at normal pool.
Shoreline Stabilization. The Ohio River shoreline north of the lake is unstable and exhibits heavy bank erosion. This shoreline will be stabilized by installing "A-jacks®" structures. This will stabilize the banks and allow natural re-vegetation and subsequent erosion control to occur.
Reforestation. Reforestation of a parcel north of the lake will reduce erosion and slow flood waters allowing the sediment load to be dropped north of Hovey Lake rather than in the lake.

Alternatives of the Selected Plan:

Smaller Size Plans Possible? **Yes** and description

Reduce the amount of dredging, reforestation, and shoreline protection.

Larger Size Plan Possible? **Yes** and description

Increase the amount of dredging, reforestation, and shoreline protection.

Other alternatives? **No**

Restore/Enhance/Protect Terrestrial Habitats? ☐ Yes ☐ Objective numbers met ☐ T1, T3

Restore, Enhance, & Protect Wetlands? ☐ Yes ☐ Objective numbers met ☐ W2

Restore/Enhance/Protect Aquatic Habitats? ☐ Yes ☐ Objective numbers met ☐ A1, A8

Type species benefited: Fish and invertebrates.

Endangered species benefited: Potential benefits to Indiana bat and Bald eagle.

Can estimated amount of habitat units be determined: 145 acres of Hovey Lake Oxbow will be restored, 125 acres of riparian forest replanted, and 0.9 miles of shoreline protected.

Plan acceptable to Resources Agencies?

U.S. Fish & Wildlife Service?

State Department of Natural Resources? **Yes** – Indiana DNR

Plan considered complete? **Connected to other plans for restoration?**

Real Estate owned by State Agency? Some **Federal Agency?** Some

Real Estate privately owned? Some

If privately owned, what is status of future acquisition? Agreements or acquisition will be required.

Does this plan contribute significantly to the ecosystem structure or function requiring restoration? What goal or values does it meet in the Ecosystem Restoration Plan?

Restore the quality of the oxbow ecosystem at Hovey Lake and prolong the life of this unique ecosystem.

Is this restoration plan a part of restoration projects planned by other agencies? (i.e. North American Waterfowl Management Plan, etc.)

No

In agencies opinion is the plan the most cost effective plan that can be implemented at this location?

Can this plan be implemented more cost effectively by another agency or institution?

Yes / No

Who:

From an incremental cost basis are there any features in this plan that would make the project more expensive than a typical project of the same nature? For embayment type plans is there excessive haul distance to disposal site? More expensive type disposal? Spoil that requires special handling/disposal?

Potential Project Sponsor:

Government Entity:_____

Non-government Entity _____

Corps Contractor _____ Date _____

U.S. Fish & Wildlife Representative _____ Date _____

State Agency Representative _____ Date _____

U.S. Army Corps of Engineers Representative _____ Date _____

Terrestrial Habitat Objectives

- T1 Riparian Corridors
- T2 Islands
- T3 Floodplains
- T4 Other unique habitats (canebrakes, river bluffs, etc.)

Wetland Habitat Objectives

- W1 Forested Wetlands: Bottomland Hardwoods
- W2 Forested Wetlands: Cypress/Tupelo Swamps and other unique forested wetlands
- W3 Scrub/Shrub Emergent Wetlands: isolated from the river except during high water and contiguous (includes scrub/shrub wetlands in embayments and island sloughs)

Aquatic Habitat Objectives

- A1 Backwaters (sloughs, embayments, oxbows, bayous, etc.)
- A2 Riverine submerged and aquatic vegetation
- A3 Sand and gravel bars
- A4 Riffles/Runs (tailwater)
- A5 Pools (deep water, slow velocity, soft substrate)
- A6 Side Channel/Back Channel Habitat
- A7 Fish Passage
- A8 Riparian Enhancement/Protection

APPENDIX D Micro Computer-Aided Cost Engineering System (MCACES)